

Emery & Garrett Groundwater Investigations, LLC

***56 Main Street • P.O. Box 1578
Meredith, New Hampshire 03253***

(603) 279-4425

www.eggi.com

Fax (603) 279-8717

~~October 24, 2014~~

Revised July 14, 2015

Mr. Dean Peschel
City of Dover
Environmental Projects Manager
271 Mast Road
Dover, NH 03820-4169

Re: Barbados Pond Aquifer Investigation – Proposal No. 983 -- Revised¹

Dear Dean,

Per your request in our recent phone conversation, Emery & Garrett Groundwater Investigations, LLC (EGGI) is pleased to present to you the enclosed revised work scope. The work tasks in this groundwater investigation are designed to assess the potential sustainable water supply production capacity of the Barbados Pond Aquifer and the City of Dover's French Cross Well (also known as the Bouchard Well) and Hughes Well (Figure 1). Specifically, the tasks are focused on determining the long-term Safe Yield of the two Production Wells, evaluating water quality issues, and defining new Wellhead Protection Area(s) for the Wells. The Safe Yield Assessment will be focused on determining what volume of water can be pumped from the French Cross Well (and possibly the Hughes Well) without adversely impairing Barbados Pond.

I hope you find this information responsive to your needs. If you have any questions regarding this proposal, please do not hesitate to contact me.

Best regards,



James M. Emery, P.G.
President/CEO

¹ Revisions include the installation of additional monitoring wells, based upon conversations with the NHDES on June 12, 2015 and the preparation of a Quality Assurance Project Plan (QAPP), per NHDES guidelines.

**Proposed Work Scope for the Evaluation of the City of Dover’s
French Cross Production Well
located within the Barbados Pond Aquifer**

NHDES GRANT APPLICATION

TASK 1: Prepare Quality Assurance Project Plan (QAPP) and Review Background Information

Task 1-A) As required by NHDES and US EPA, the City, through its consultant (EGGI), will draft a QAPP related to the collection methods, equipment and data quality control measures required for the project. NHDES will provide guidance for developing a QAPP, and will illustrate examples of existing QAPPs from similar type projects. A final draft of the QAPP will be provided to NHDES for review and approval by NHDES and USEPA prior to commencement of the following tasks.

Estimated Cost Task 1-A.....\$4,000

Task 1-B) EGGI personnel will review available reports and hydrogeologic data pertaining to the hydrogeologic setting of the Barbados Pond Aquifer and the historic utilization of the two City Production Wells. This review will include the following data sources:

- Reports by previous consultants;
- Data collected by the NHDES as part of their ongoing investigation/monitoring program;
- Review of existing numerical model to assess historic hydrogeologic data that was collected for the previous safe yield evaluation;
- Water use and water quality data for the Production Wells, as recorded by the City of Dover;
- NHDES records of water use and water quality.

This information will be used to create a conceptual model of the hydrogeologic setting of the Barbados Pond Aquifer. These data will also be used to highlight the critical issues associated with the use of the French Cross and Hughes Production Wells and their potential impact on Barbados Pond. Insights gained from this background review will serve as the basis for generating an interim report to be presented to the NHDES.

Estimated Cost – Task 1-B.....\$6,500

TASK 2: Conduct Meeting with NHDES Personnel and City of Dover and Review Interim Report

Following EGGI’s review and analyses of the available background data, EGGI personnel will meet with New Hampshire Department of Environmental Services (NHDES) and

City of Dover personnel to discuss a proposed plan for the required work needed to determine how water resources derived from the French Cross (and/possibly the Hughes Wells) can be utilized in the future. The results of this meeting will form the basis of additional site-specific work tasks that may be needed.

Estimated Cost – Task 2.....\$1,500

TASK 3-A: Installation of Observation Wells and Piezometers

Estimated Cost – Task 3-A.....\$19,350

TASK 3-B: Rental and Install Automated Water Level Recorders

EGGI will install automated water level equipment for the purposes of long-term monitoring of the groundwater system of the Barbados Pond Aquifer.

Estimated Cost – Task 3-B.....\$7,500

TASK 4: Conduct Long-Term Pumping Test and Water Quality Assessment Program

If the results of Tasks 1-4 indicated that it is warranted, a two- to four-week constant rate pumping test of the French Cross Well (and possibly the Hughes Production Well) will be completed to determine the Zone of Influence (ZOI) around the Well and to quantify pumping-induced impacts to water levels in Barbados Pond. The results of this pumping test will serve as the basis for establishing a firm and defensible sustainable “safe” yield for the two Production Wells that will maximize withdrawals from the Barbados Pond Aquifer while, at the same time, protect natural resources, and limit adverse impacts to Barbados Pond.

This pumping test program will include the collection and analyses of a significant amount of water quality data to help evaluate the hydraulic connection between the Aquifer sediments and the surface water in the Pond. New shallow monitoring wells, piezometers, and surface water monitoring stations will likely need to be installed prior to this test. It is anticipated that a minimum of 20 monitoring locations will be used as part of this testing and assessment program.

Estimated Cost – Task 4.....\$35,000²

TASK 5: Refinement of Well 5 and Well 6 Wellhead Protection Area (WHPA)

Following the completion of Task 4, EGGI shall refine the Wellhead Protection Area (WHPA) delineation within the context and limits of the data collected. In order to ensure that the test-related data is appropriately reduced and the associated WHPA is properly developed, EGGI will have a licensed professional geologist or engineer on the project team, have

² Assumes existing pumps in the Wells can be used for the testing program.

proficiency in collecting and analyzing hydrogeologic information, and have experience in developing WHPAs. The cost for Task 5 is included in Task 6.

TASK 6: Submit Final Report to City

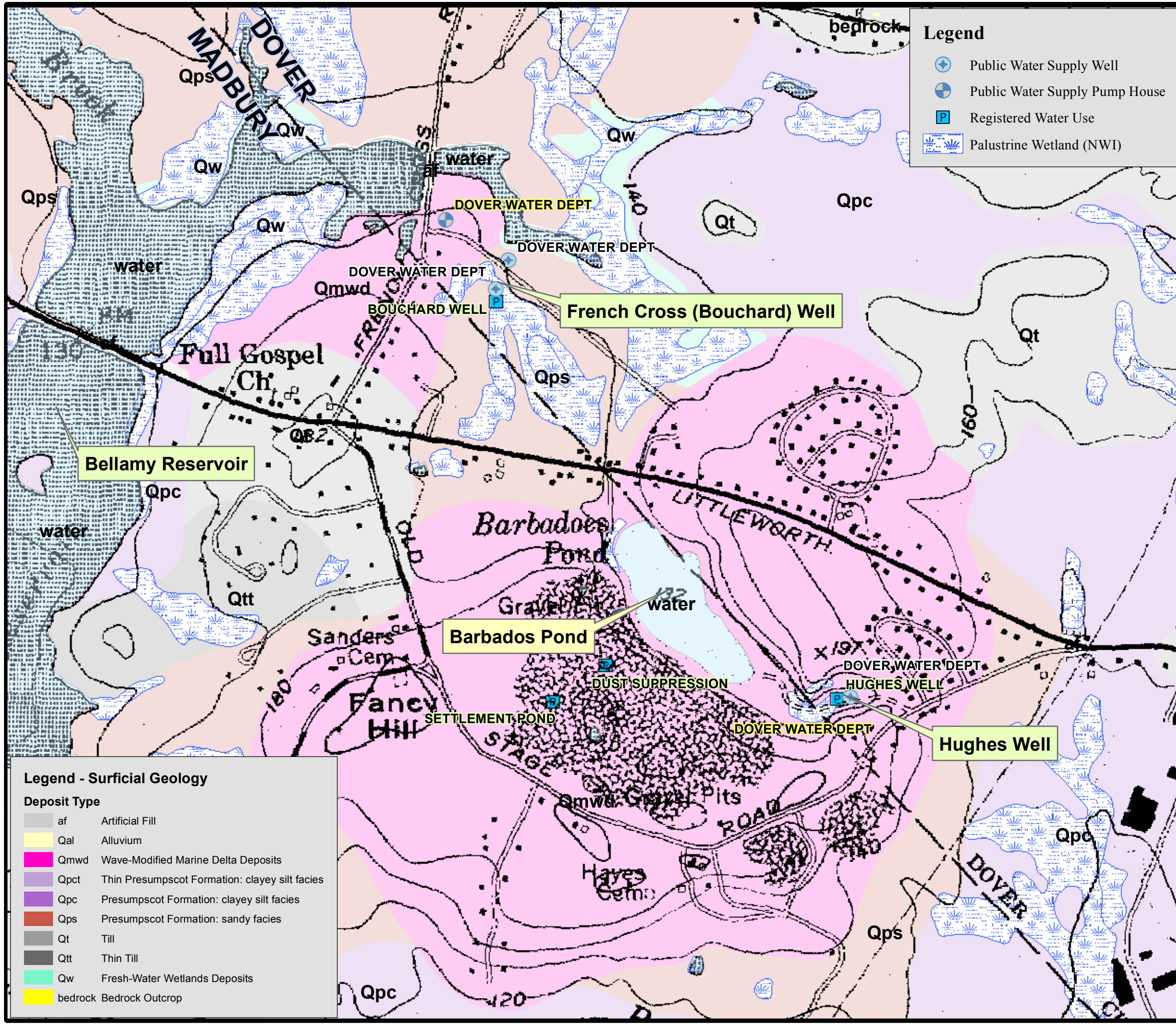
A final report summarizing the results of the work tasks noted above will be submitted to the City of Dover. This report will include analyses of the data and the determination of the “Safe Yield” of the French Cross and Hughes Wells. A new Wellhead Protection Area (WHPA) for the Wells will also be defined. A recommended Water Management Plan and Pumping Operation Plan for the use of the two Wells will be included in the report that serves to maximize groundwater withdrawals from the Wells while minimizing potential adverse impacts to Barbados Pond.

Estimated Cost – Task 6.....\$20,000

TOTAL ESTIMATED COST – TASKS 1-6.....\$93,850³

³ Assumes that a new numerical groundwater model is not needed.

O:\nh\PROPOSALS\Dover_BarbadosPond\Proposal.mxd



Legend - Surficial Geology	
Deposit Type	
af	Artificial Fill
Qal	Alluvium
Qmwd	Wave-Modified Marine Delta Deposits
Qpct	Thin Presumpscot Formation: clayey silt facies
Qpc	Presumpscot Formation: clayey silt facies
Qps	Presumpscot Formation: sandy facies
Qt	Till
Qtt	Thin Till
Qw	Fresh-Water Wetlands Deposits
bedrock	Bedrock Outcrop

Legend	
	Public Water Supply Well
	Public Water Supply Pump House
	Registered Water Use
	Palustrine Wetland (NWI)

FIGURE 1

Surficial Geology Of Barbados Pond Area

Proposal to City of Dover

Red square shows the extent of detailed View

1:96,000

Scale of Detailed View
Scale is 1:9,600
1 inch = 800 feet

Emery & Garrett
Groundwater Investigations, LLC

FIGURE 1